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10/741,324	12/18/2003	Olga Alexandrovna Ponomareva	129420-2	6945

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
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NISKAYUNA, NY 12309

EXAMINER

DOUGLAS, JOHN CHRISTOPHER

ART UNIT	PAPER NUMBER
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1764

DATE MAILED: 08/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/741,324

Applicant(s)

PONOMAREVA ET AL.

Examiner

John C. Douglas

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>12/18/03 + 4/22/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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4. Claims 1-11, 14-20, 23-26, 31, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura (US 4982037) in view of Apelian (US 5238677) and Lee (US 50150797).

5. With respect to claims 1, 2, 5-11, 14-16, 19, 20, 25, 26, and 31, Nakamura discloses a process for producing 4,4'-diisopropylbiphenyl by contacting a biphenyl with propylene and a mordenite or ZSM-5 type catalysts (having Si/Al molar ratio of not less than 10) at a temperature between 220 and 300 degrees C (see Nakamura, column 2, lines 1-37 and 67-68).

Nakamura does not disclose where the catalyst has acidic sites of which 35% or more have an activation energy of ammonia desorption in a range between about 145 kJ/mol and about 170 kJ/mol, does not disclose that the reaction is continuous, and does not disclose that the feed is contacted with at least one inert solvent and an inert diluent gas.

The Applicant's specification discloses catalyst having the desired distribution of acidic sites can be prepared by modifying a mordenite zeolite by calcination at temperatures in a range between about 740-760 degrees C (500-800 degrees C in one embodiment in paragraph 23 of specification) for at least 2 hours followed by treatment with oxalic acid for 1 hour at about 100 degrees C, thereafter filter washed with water and dried (see Specification, paragraph 26).

However, Apelian discloses a process for dealumination of mordenite to achieve a Si/Al ratio of greater than 15, which includes calcining a mordenite at 1000 degrees F (538 C) for 3 hours followed by treatment with a 2 molar oxalic acid for 1 hour at 180

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degrees F (82C) and then washed with water and dried (see Apelian, examples and column 4, lines 17-23). Also, the process in Apelian is similar to the process in the Applicant's specification, which produces catalysts having acidic sites of which 35% or more have an activation energy of ammonia desorption in a range between about 145 kJ/mol and about 170 kJ/mol (see Specification, paragraphs 18,19 and 26).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura to include a process for dealumination of mordenite, which includes calcining a mordenite at 1000 degrees F (538 C) for 3 hours followed by treatment with a 2 molar oxalic acid for 1 hour at 180 degrees F (82C) and then washed with water and dried (which produces catalysts having acidic sites of which 35% or more have an activation energy of ammonia desorption in a range between about 145 kJ/mol and about 170 kJ/mol) in order to achieve a Si/Al ratio of greater than 15.

Also, Lee discloses where the alkylating agent is diluted with a diluent gas including nitrogen and argon (see Lee, column 7, lines 3-15). Lee also discloses where the process is operated continuously (see Lee, column 15, lines 50-62).

Lee discloses that the use of a diluting agent increases the selectivity to near linear isomers (see Lee, column 7, lines 4-6). Also, MPEP §2144.04 V. E. cites *In re Dilnot*, 319 F.2d 188 (CCPA 1963), which held that continuous operation would have been obvious over the batch processes of the prior art.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura to include here the

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alkylating agent is diluted with a diluent gas including nitrogen and argon in order to increase the selectivity to near linear isomers and to include where the process is operated continuously because continuous operation would have been obvious over the batch processes of the prior art.

Also, Lee discloses where a decalin solvent is mixed with the biphenyl (see Lee, column 6, lines 9-16).

Lee discloses that the use of a solvent increases the selectivity to near linear isomers (see Lee, column 7, lines 4-6).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura to include where a decalin solvent is mixed with the biphenyl in order to increase the selectivity to near linear isomers.

6. With respect to claims 3 and 4, Apelian discloses where the dealumination step comprises steam treatment at temperatures in the range of from about 600 to about 1200 degrees F (315-650 C) (see Apelian, column 3, lines 35-50).

7. With respect to claims 17 and 18, Nakamura discloses where the molar ratio of propylene to biphenyl is 0.5 to 2.2 (see Nakamura, column 2, lines 57-58 and claim 2).

8. With respect to claims 23 and 24, Lee discloses where the contacting is performed under a pressure from about 10 psig (1.7 atm) to about 500 psig (35 atm) (see Lee, column 16, lines 30-41).

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9. With respect to claim 29, Lee discloses where the selectivity to total dialkylated biphenyls is typically about 25 to about 80 mole percent (see Lee, column 17, lines 18-30).

10. With respect to claim 30, Lee discloses where yields of dialkylates preferably are at least 60 percent (see Lee, column 18, lines 34-64).

11. Claims 12, 13, 27, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura in view of Lee as applied to claim 1 above, and further in view of Holtermann (US 5149894).

12. With respect to claims 12 and 13, Nakamura in view of Lee and Apelian disclose everything in claim 1 (see paragraph 5), but do not disclose where the biphenyl is continuously contacted with the solid catalyst at a weight hourly space velocity of between about 0.1 and about 2.5 1/h.

However, Holtermann discloses where the biphenyl is fed at a WHSV of from about 0.5 to about 50 (see Holtermann, column 9, lines 36-42 and column 10, lines 41-49).

Holtermann discloses that the biphenyl is generally fed at that rate because the reaction pressure should be sufficient to maintain at least a partial liquid phase to retard catalyst fouling (see Holtermann, column 10, lines 41-49).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura in view of Lee and Apelian to include the biphenyl is fed at a WHSV of from about 0.5 to about 50 in order to slow catalyst fouling.

13. With respect to claims 27 and 28, Nakamura in view of Lee and Apelian disclose everything in claim 1 (see paragraph 5), but do not disclose where the biphenyl and inert solvent are continuously contacted with the acidic catalyst at a feed rate corresponding to between about 1 and about 3 catalyst bed volumes per hour.

However, Holtermann discloses where the alkylation reaction has a LHSV of from about 0.1 to about 10 1/h (see Holtermann, column 13, lines 7-22).

Holtermann discloses that the LHSV is dependent upon the reaction temperature and pressure (see Holtermann, column 13, lines 43-47).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura in view of Lee and Apelian to include where the alkylation reaction has a LHSV of from about 0.1 to about 10 1/h because the LHSV is dependent on the temperature and pressure of the alkylation reaction.

14. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura in view of Apelian and Lee as applied to claim 1 above, and further in view of Cupples (US 4045508). Nakamura in view of Apelian and Lee disclose everything in claim 1 (see paragraph 5), but do not disclose the amount of diluent gas per biphenyl.

However, Cupples discloses where the diluent is present in an amount of 80 percent of the entire reaction liquid (see Cupples, column 6, lines 4-19).

Cupples discloses that the diluent is present in such an amount as to reduce the conversion in the reactor (see Cupples, column 6, lines 4-19).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura in view of Apelian and Lee to include where the diluent is present in an amount of 80 percent of the entire reaction liquid in order to reduce the conversion in the reactor.

15. Claims 32-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura in view of Apelian and Lee as applied to claim 1 above, and further in view of Shihabi (US 4448673). Nakamura in view of Apelian and Lee disclose everything in claim 1 (see paragraph 5), but do not disclose contacting the acidic zeolite with ammonia at temperatures between about 0 to about 500 degrees C at pressures between about 0.1 torr and about 10 atmospheres.

However, Shihabi discloses contacting a zeolite with ammonia at atmospheric pressure at 1200 degrees F in order to reduce the acidity of the zeolite to a necessary level (see Shihabi, column 6, lines 28-38).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura in view of Apelian and Lee to include contacting a zeolite with ammonia at atmospheric pressure at 1200 degrees F in order to reduce the acidity of the zeolite to a necessary level.

16. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura in view of Apelian, Lee and Shihabi as applied to claim 33 above, and further in view of Cao (US 6080303). Nakamura in view of Apelian, Lee and Shihabi disclose everything in claim 1 (see paragraph 5), but do not disclose contacting the acid zeolite with phosphine.

However, Cao discloses contacting a catalyst with phosphine in order to the activity of the catalyst (see Cao, column 2, lines 8-27).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura in view of Apelian, Lee and Shihabi to include contacting a catalyst with phosphine in order to the activity of the catalyst.

17. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura in view of Apelian, Lee and Holtermann. Nakamura discloses a process for producing 4,4'-diisopropylbiphenyl by contacting a biphenyl with propylene (where the molar ratio of propylene to biphenyl is 0.5 to 2.2) and a mordenite or ZSM-5 type catalysts (that have a molar ratio of SiO_2 to Al_2O_3 of from 10 to about 50) at a temperature between 220 and 300 degrees C (see Nakamura, column 2, lines 1-37, 53-56 and 67-68).

Nakamura does not disclose where the catalyst has acidic sites of which 35% or more have an activation energy of ammonia desorption in a range between about 145 kJ/mol and about 170 kJ/mol. Nakamura does not disclose that the reaction is continuous and that the feed is contacted with at least one inert solvent and an inert diluent gas. Nakamura does not disclose where the contacting is performed under a pressure of from about 2 atmospheres to about 50 atmospheres. Nakamura does not disclose where the biphenyl and inert solvent are continuously contacted with the acidic catalyst at a feed rate corresponding to between about 0.1 and about 5 catalyst bed volumes per hour.

The Applicant's specification discloses catalyst having the desired distribution of acidic sites can be prepared by modifying a mordenite zeolite by calcination at temperatures in a range between about 740-760 degrees C (500-800 degrees C in one embodiment in paragraph 23 of specification) for at least 2 hours followed by treatment with oxalic acid for 1 hour at about 100 degrees C, thereafter filter washed with water and dried (see Specification, paragraph 26).

However, Apelian discloses a process for dealumination of mordenite to achieve a Si/Al ratio of greater than 15, which includes calcining a mordenite at 1000 degrees F (538 C) for 3 hours followed by treatment with a 2 molar oxalic acid for 1 hour at 180 degrees F (82C) and then washed with water and dried (see Apelian, examples and column 4, lines 17-23). Also, the process in Apelian is similar to the process in the Applicant's specification, which produces catalysts having acidic sites of which 35% or more have an activation energy of ammonia desorption in a range between about 145 kJ/mol and about 170 kJ/mol (see Specification, paragraphs 18,19 and 26).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura to include a process for dealumination of mordenite, which includes calcining a mordenite at 1000 degrees F (538 C) for 3 hours followed by treatment with a 2 molar oxalic acid for 1 hour at 180 degrees F (82C) and then washed with water and dried (which produces catalysts having acidic sites of which 35% or more have an activation energy of ammonia desorption in a range between about 145 kJ/mol and about 170 kJ/mol) in order to achieve a Si/Al ratio of greater than 15.

However, Lee discloses where the alkylating agent is diluted with a diluent gas including nitrogen and argon (see Lee, column 7, lines 3-15). Lee also discloses where the process is operated continuously (see Lee, column 15, lines 50-62).

Lee discloses that the use of a diluting agent increases the selectivity to near linear isomers (see Lee, column 7, lines 4-6). Also, MPEP §2144.04 V. E. cites *In re Dilnot*, 319 F.2d 188 (CCPA 1963), which held that continuous operation would have been obvious over the batch processes of the prior art.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura to include here the alkylating agent is diluted with a diluent gas including nitrogen and argon in order to increase the selectivity to near linear isomers and to include where the process is operated continuously because continuous operation would have been obvious over the batch processes of the prior art.

Also, Lee discloses where a decalin solvent is mixed with the biphenyl (see Lee, column 6, lines 9-16).

Lee discloses that the use of a solvent increases the selectivity to near linear isomers (see Lee, column 7, lines 4-6).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura to include where a decalin solvent is mixed with the biphenyl in order to increase the selectivity to near linear isomers.

Lee also discloses where the contacting is performed under a pressure from about 10 psig (1.7 atm) to about 500 psig (35 atm) (see Lee, column 16, lines 30-41).

Lee discloses that a pressure less than 10 psig causes the catalyst to lose selectivity for linear and near linear isomers and a pressure greater than 500 psig will cause the olefin to polymerize (see Lee, column 16, lines 30-41).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura to include where the contacting is performed under a pressure from about 10 psig (1.7 atm) to about 500 psig (35 atm) in order to maintain selectivity for linear and near linear isomers and avoid polymerization of the olefin.

In addition, Holtermann discloses where the alkylation reaction has a LHSV of from about 0.1 to about 10 1/h (see Holtermann, column 13, lines 7-22).

Holtermann discloses that the LHSV is dependent upon the reaction temperature and pressure (see Holtermann, column 13, lines 43-47).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura in view of Lee to include where the alkylation reaction has a LHSV of from about 0.1 to about 10 1/h because the LHSV is dependent on the temperature and pressure of the alkylation reaction.

18. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura in view of Apelian, Lee and Holtermann as applied to claim 37 above, and further in view of Shihabi. Nakamura in view of Apelian, Lee and Holtermann disclose everything in claim 37 (see paragraph 17), but do not disclose contacting the acidic

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zeolite with ammonia at temperatures between about 0 to about 500 degrees C at pressures between about 0.1 torr and about 10 atmospheres.

However, Shihabi discloses contacting a zeolite with ammonia at atmospheric pressure at 1200 degrees F in order to reduce the acidity of the zeolite to a necessary level (see Shihabi, column 6, lines 28-38).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Nakamura in view of Apelian, Lee and Holtermann to include contacting a zeolite with ammonia at atmospheric pressure at 1200 degrees F in order to reduce the acidity of the zeolite to a necessary level.

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Chen (US 3551553).


Any inquiry concerning this communication or earlier communications from the examiner should be directed to John C. Douglas whose telephone number is 571-272-1087. The examiner can normally be reached on 7:30 A.M. to 4:30 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JCD

8/8/2006



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